

REMARKS

Claims 1-40 are pending in the present application. Claims 14-17 and 26 are withdrawn from consideration. Claim 8 has been canceled. Claims 1, 9, and 40 have been amended to place them in condition for allowance. Reconsideration and allowance of claims 1-7, 9-13, 18-25, and 27-40 is respectfully requested in view of the following remarks.

Claim Amendments

Independent claims 1 and 40 have been amended to incorporate the functionalized poly(arylene ether) structure of claim 8 as filed. Claim 8 has been canceled without prejudice.

Claim Rejection Under 35 U.S.C. § 103(a) over Ishii

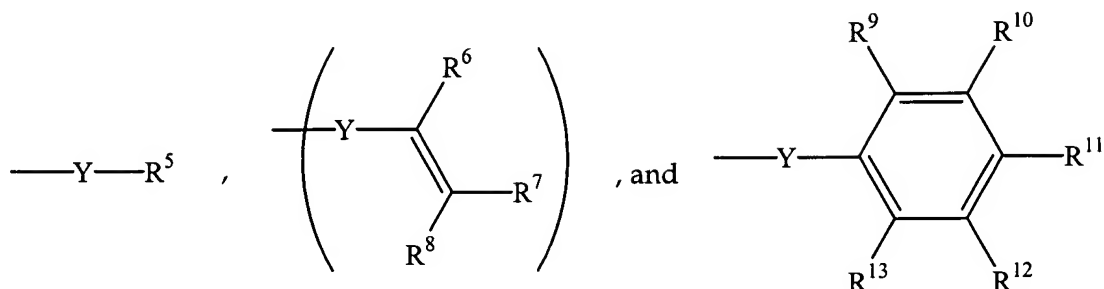
Claims 1-13, 21, 27-31, 34, 37 and 40 were rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 6,835,786 to Ishii et al. ("Ishii"). Applicants respectfully traverse this rejection.

Ishii is not available as a reference. Ishii, was filed in the United States on July 25, 2003, published in the United States on July 8, 2004 as U.S. Patent Application Publication No. US 2004/0132941 A1, and issued on December 28, 2004 as U.S. Patent No. 6,835,786 B2. The present application was filed October 3, 2003. Ishii is therefore was not "patented or described in a printed publication . . . more than one year prior to the date of application for patent in the United States" under 35 U.S.C. § 102(b). Nor was Ishii "described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent" under 35 U.S.C. § 102(a). Ishii is also unavailable as a reference under 35 U.S.C. § 102(e)(2), because, as evidenced by the accompanying declaration under 37 C.F.R. § 1.131, Ishii is not "a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent." In other words, Applicants can "swear behind" Ishii because, as explained in detail below, (1) Applicants reduced their invention to practice before Ishii's U.S. application was filed, and (2) Ishii does not claim the same invention as Applicants.

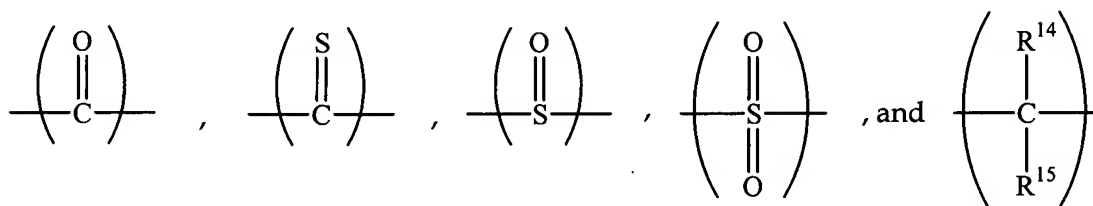
Applicants reduced their invention to practice before Ishii's U.S. application was filed. Submitted herewith is a declaration by Applicants, under 37 C.F.R. §1.131, showing that Applicants reduced their invention to practice before the July 25, 2003 filing date of Ishii. In particular, the Exhibit accompanying the declaration evidences conception, preparation, and testing of a curable composition representative of Applicants' claim 1. The Exhibit, while not itself dated, was incorporated by reference into a research disclosure document that is itself dated prior to the July 25, 2003 filing date of Ishii. Note, in particular, that Formulation 12 in the Exhibit is a curable composition meeting Applicants' claim 1 limitations. Formulation 12 comprises a functionalized poly(arylene ether) meeting the claim 1 limitations for that component ("PPO-MA(0.12)", which is methacrylate-capped poly(2,6-dimethyl-1,4-phenylene ether) having an intrinsic viscosity of 0.12 deciliters per gram), an olefinically unsaturated monomer (a mixture of "Diallylphthalate" and "TMPTMA", which is trimethylolpropane trimethacrylate), about 0.2 to about 5 part by weight of a curing initiator per 100 parts by weight total of the functionalized poly(arylene ether) and the olefinically unsaturated monomer (2.47 parts by weight dicumyl peroxide per 100 parts by weight total of "PPO-MA(0.12)", "Diallylphthalate", and "TMPTMA"); and about 0.005 to about 1 part by weight of a curing inhibitor per 100 parts by weight total of the functionalized poly(arylene ether) and the olefinically unsaturated monomer (0.24 parts by weight t-butyl catechol per 100 parts by weight total of "PPO-MA(0.12)", "Diallylphthalate", and "TMPTMA"). The Exhibit thus shows reduction to practice of a composition falling within the scope of Applicants' claims. *See* MPEP 715.02.

Ishii does not claim the same invention as Applicants. Ishii claims "methacrylate compounds" which comprise two (meth)acrylate (i.e., acrylate or methacrylate) groups at each terminus of the polyfunctional methacrylate compound. Ishii, claim 1. In contrast, the functionalized poly(arylene ether) of Applicants' claim 1 comprises, at most, one (meth)acrylate group at each terminus of the poly(arylene ether). Note that the capping group K in Applicants' claim 1 functionalized poly(arylene ether) structure is

selected from the group consisting of



wherein R^5 is $\text{C}_1\text{-C}_{12}$ hydrocarbyl optionally substituted with one or two carboxylic acid groups, $\text{R}^6\text{-R}^8$ are each independently hydrogen, $\text{C}_1\text{-C}_{18}$ hydrocarbyl optionally substituted with one or two carboxylic acid groups, $\text{C}_2\text{-C}_{18}$ hydrocarbyloxycarbonyl, nitrile, formyl, carboxylic acid, imidate, and thiocarboxylic acid; $\text{R}^9\text{-R}^{13}$ are each independently selected from the group consisting of hydrogen, halogen, $\text{C}_1\text{-C}_{12}$ alkyl, hydroxy, carboxylic acid, and amino; and wherein Y is a divalent group selected from the group consisting of



wherein R^{14} and R^{15} are each independently selected from the group consisting of hydrogen and $\text{C}_1\text{-C}_{12}$ alkyl.

Thus, K cannot contain two (meth)acrylate groups, as required by Ishii's claims.

To summarize, Ishii is not available as a reference because Applicants have "sworn behind" Ishii. Given that claim 8 has been canceled, Applicants respectfully request the reconsideration and withdrawal of the rejection of claim 1-7, 9-13, 21, 27-31, 34, 37 and 40 under 35 U.S.C. § 103(a) over Ishii.

Claim Rejection Under 35 U.S.C. § 103(a) over Ishii in view of Kagaya

Claims 1-13, 21-25, 27-31, 34, 37 and 40 were rejected under 35 U.S.C. § 103(a), as allegedly being unpatentable over Ishii in view of U.S. Patent No. 5,102,605 to Kagaya et al.

("Kagaya"). Applicants respectfully traverse this rejection.

As described in detail above, Ishii, the primary reference here, is not available as a reference. Given that claim 8 has been canceled, Applicants respectfully request the reconsideration and withdrawal of the rejection of claims 1-7, 9-13, 21-25, 27-31, 34, 37 and 40 under 35 U.S.C. § 103(a) over Ishii in view of Kagaya.

Claim Rejection Under 35 U.S.C. § 103(a) over Yeager or Zarnoch in view of Ishii

Claims 1-13, 18-23, 27-31, 34, 37 and 40 were rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 6,352,782 to Yeager et al. ("Yeager") or U.S. Patent Application Publication No. US 2002/0173597 to Zarnoch et al. ("Zarnoch") in view of Ishii. Applicants respectfully traverse this rejection.

As described in detail above, Ishii, the secondary reference here, is not available as a reference. Without Ishii, a prima facie case of obviousness has not been established, because neither Yeager nor Zarnoch teaches or suggests the use of curing inhibitors. Given that claim 8 has been canceled, Applicants respectfully request the reconsideration and withdrawal of the rejection of claims 1-7, 9-13, 18-23, 27-31, 34, 37 and 40 under 35 U.S.C. § 103(a) over Yeager or Zarnoch in view of Ishii.

Claim Rejection Under 35 U.S.C. § 103(a) over Yeager or Zarnoch in view of Harada and Kagaya

Claims 1-13, 18-25, 27-40 were rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Yeager et al. or Zarnoch et al. in view of U.S. Patent No. 3,656,980 to Harada et al. ("Harada") optionally in further view of Kagaya. Applicants respectfully traverse this rejection.

Yeager generally describes formation of a capped poly(phenylene ether) resin composition comprising (1) a reactively endcapped poly(phenylene ether) and (2) a curable unsaturated monomer. Yeager abstract. Yeager's curable compositions may optionally include curing catalysts. Yeager, col. 12, lines 13-31. There are no general teachings about curing catalyst amounts, but Yeager's working examples include curing catalysts at levels of 0.2 to 3.09 parts by weight per 100 parts by weight resin (i.e., 0.2 to 3 weight percent, based on the total weight of the composition). Yeager

does not teach the use of curing inhibitors. Yeager mentions “antioxidants” among various fillers that can be used in the composition. Yeager, col. 15, line 10. However, no specific antioxidants are mentioned.

Zarnoch generally describes a curable resin composition including a poly(arylene ether), an allylic monomer, and an acryloyl monomer. Zarnoch abstract. The resin composition may be formulated as a powder. *Id.* Zarnoch teaches the optional use of a curing catalyst in an amount of about 0.1 to about 10 parts by weight per 100 parts by weight resin. Zarnoch, pages 5-6, paragraphs [0062] and [0063]. Zarnoch does not teach the use of curing inhibitors. Zarnoch mentions “antioxidants” among various additives that can be used in the composition. Zarnoch, page 6, paragraph [0064]. However, no specific antioxidants are mentioned.

Harada generally describes a homogeneous 4-tertiary-butyl-catechol aqueous solution composition comprising 4-tertiary-butyl-catechol, water, and a saturated hydrocarbon having five or more carbon atoms. Harada abstract. Harada teaches that 4-tertiary-butyl-catechol may be used as a polymerization inhibitor during polymerization of many industrially valuable polymerizable monomers. Harada, col. 1, lines 7-10.

Kagaya generally describes a method of making a molded article by injecting into a mold filled with reinforcing material a resin composition including (a) 40 to 80% by weight of a resin including an oligomer having a number average molecular weight of 900 to 3,000 in terms of polystyrene equivalent obtained by gel permeation chromatography and having two or more terminal (meth)acrylate groups and an unsaturated polyester, and (b) 20 to 60% by weight of methyl (meth)acrylate monomer. Kagaya abstract. Kagaya teaches that a curing catalyst may be used in an amount of about 0.1 to 4 parts by weight per 100 parts by weight resin. Kagaya, col. 6, ll. 30-33. Kagaya also teaches that a “curing retarder,” such as tertiary-butylcatechol, may be used in an amount of 0.0001 to 0.1 part by weight per 100 parts by weight resin. Kagaya, col. 6, lines 37-41. Kagaya does not teach the use of poly(arylene ether) resins of any kind, let alone the functionalized poly(arylene ether) of Applicants’ amended claim 1.

Applicants respectfully assert that the rejected claims are patentable over Yeager or Zarnoch in view of Harada and Kagaya for at least four reasons. First, there is no motivation for one of ordinary skill in the art to combine Yeager or Zarnoch with Harada and Kagaya. Second, even if there were a motivation to make such a combination, the combination does not provide a suggestion of or expectation of success for Applicants' claimed compositions. Third, Applicants' claim 1 ratio of curing initiator to curing inhibitor represents a previously unrecognized result-effective variable.

1. There is No Motivation to Combine Yeager or Zarnoch with Harada and Kagaya

There is no motivation to combine the primary references, Yeager and Zarnoch, with the secondary references, Harada and Kagaya. "When a rejection depends on a combination of prior art references, there must be some teaching, suggestion, or motivation to combine the references." *Ecolochem, Inc. v. Southern California Edison Co.*, 56 U.S.P.Q.2d 1065, 1073 (quoting *In re Rouffet*, 47 USPQ2d 1453, 1456 (Fed. Cir. 1998)). The evidence of a motivation to combine must be "clear and particular." *In re Dembiczak*, 50 U.S.P.Q.2d 1614, 1617 (Fed. Cir. 1999). Here, there is no clear and particular evidence of a motivation to combine either of the primary references with Harada or Kagaya.

As mentioned above, Harada relates to solutions of t-butylcatechol in water/hydrocarbon mixtures. Harada's solutions contain substantial amounts of water. See Harada, cols. 1-4, Table 1, indicating 2-25% water by weight. Harada's solutions also contain substantial amounts of hydrocarbons. See Harada, cols. 1-4, Table 1, indicating 2-83% water by weight. One of ordinary skill in the art would not be motivated combine Harada with Yeager or Zarnoch because Harada's solvents are incompatible with the compositions of Yeager or Zarnoch. In particular, Harada's water would be insoluble in the Yeager and Zarnoch compositions, which are generally very hydrophobic, and water would boil (or at least have a very substantial vapor pressure) at the curing temperatures used in Yeager and Zarnoch, creating molding defects. See, e.g., Yeager at col. 14, lines 53-55 ("When heat curing is used, the temperature selected can range from about 80° to about 300° C., and preferably from about 120° to about 240° C.); and Zarnoch, paragraphs [0083] and [0089] (showing a curing temperature of 150°C in Examples 1-3 and a curing temperature of 155°C in Example 4). Many of Harada's hydrocarbon solvents would also be expected to boil at the curing temperatures in

Yeager and Zarnoch. Furthermore, the water in Harada's solutions could potentially hydrolyze the (meth)acrylate ester groups on the functionalized poly(arylene ether) resins of Yeager and Zarnoch. And addition of Harada's liquid solutions would conflict with the Zarnoch's objective of providing a powdered composition. *See, e.g.,* Zarnoch, claim 1. For all of these reasons, one of ordinary skill in the art would not be motivated to combine Harada with Yeager or Zarnoch.

There is also no motivation to combine Kagaya with Yeager or Zarnoch. Kagaya was faced with the challenge of preventing cracking of molded articles without extending curing time or reducing mechanical strength. Kagaya, col. 1, ll. 46-51. Kagaya solved this problem by formulating a composition in which an unsaturated polyester resin and a (meth)acrylate-terminated epoxy acrylate oligomer or a (meth)acrylate-terminated polyester acrylate oligomer are dissolved in methyl (meth)acrylate monomer. Kagaya, col. 1, ll. 54-63, and col. 3, lines 21-23. Kagaya does not teach or suggest using the poly(arylene ether) of Yeager or Zarnoch. Kagaya's compositions may optionally contain additives such as "thickener, coloring agent, reinforcing agent, filler, curing catalyst, curing accelerator, curing retarder, internal lubricant and/or low shrink agent." Kagaya, col. 5, ll. 22-26. Kagaya does not teach or suggest any particular composition property associated with the use of the "curing retarder." Note also that Kagaya's working examples allegedly demonstrate the advantages of the invention without ever incorporating a "curing retarder." Kagaya, col. 11, line 35 to col. 12, line 49; and col. 17, line 25 to col. 19, line 42. Kagaya's curing temperatures of 10-80°C, Kagaya, col. 7, ll. 25-26, are also largely incompatible with Yeager's curing temperature of about 80° to about 300° C, and Zarnoch's a curing temperatures of 150 and 155°C. Considering all of these differences between Kagaya and the primary references, there is no motivation for one of ordinary skill in the art to combine Kagaya with Yeager or Zarnoch in order to pluck the curing retarder and associated amounts out of Kagaya for incorporation into Yeager or Zarnoch.

There is therefore no motivation to combine Harada or Kagaya with Yeager or Zarnoch.

2. The Combined References Do Not Provide a Suggestion of or Expectation of Success for Applicants' Claimed Compositions

Even if there were a motivation to combine Harada or Kagaya with Yeager or Zarnoch, which

Applicants do not concede, the combined references do not suggest Applicants' claimed compositions or provide a reasonable expectation for their success. "Both the suggestion and the reasonable expectation of success must be founded in the prior art, not in the applicant's disclosure." *In re Vaeck*, 20 U.S.P.Q.2d, 1438, 1442 (Fed. Cir. 1991).

If a person of ordinary skill in the art (the "artisan") had combined Harada with Yeager or Zarnoch, and if that artisan were to overlook the obvious incompatibility of Harada's water and hydrocarbon solvents with the Yeager or Zarnoch compositions, then the artisan would have added Harada's t-butylcatechol solution to the curable compositions. The artisan would have quickly discovered that Harada's water and hydrocarbon solvents were incompatible with the primary references' thermal curing conditions, and there would have been no motivation to continue the experimentation necessary to arrive at Applicants' claimed initiator/inhibitor ratio. An artisan combining Harada with Yeager or Zarnoch would therefore not have obtained Applicants' claim 1 composition with its limitation on the ratio of initiator to inhibitor.

Furthermore, Harada's statement that t-butylcatechol is used broadly "as a polymerization inhibitor for many industrially valuable polymerizable monomers during their storage or during polymerization thereof," Harada, col. 1, lines 7-10, does not provide a reasonable expectation of success for the incorporation of Harada's solutions into the curable compositions of Yeager or Zarnoch. The suggestion is, at best, tantamount to an impermissible suggestion that it would be "obvious to try" in the Yeager or Zarnoch compositions any additive taught in any reference related to compositions that cure by polymerization of compounds with carbon-carbon double bonds, whether or not any purported advantage is attributed to the additive. That is not the standard for obviousness. *See, e.g., In re O'Farrell*, 7 U.S.P.Q.2d 1673, 1681 (Fed. Cir. 1988). Such a suggestion does not satisfy the requirement for a reasonable expectation for success.

If a person of ordinary skill in the art had combined Kagaya with Yeager or Zarnoch, that artisan would have selected Kagaya's methyl (meth)acrylate monomer and (meth)acrylate-terminated oligomer for incorporation into the Yeager or Zarnoch compositions. Note that Kagaya attributes the property advantages of his working examples to presence of these components. Kagaya, col. 19, lines 29-42. An artisan combining Kagaya with Yeager or Zarnoch would therefore not have

obtained Applicants' claim 1 composition with its limitations directed to the presence of inhibitor and the ratio of initiator to inhibitor. Nor does Kagaya provide a reasonable expectation of success for the incorporation of curing retarder into Yeager or Zarnoch. None of Kagaya's working examples uses a curing retarder, and no property advantages are attributed to the use of curing retarder.

The combined references therefore fail to provide a suggestion of or expectation of success for Applicants' claimed compositions.

3. Applicants' Claim 1 Initiator/Inhibitor Ratio is a Result-Effective Variable

Applicants' claim 1 ratio of initiator to inhibitor represents a previously unrecognized result-effective variable. While acknowledging the rule that the discovery of an optimum value of a variable in a known process is normally obvious, courts have sometimes found exceptions to the rule where the parameter optimized was not recognized to be a result-effective variable. *See, e.g., In re Antonie*, 195 U.S.P.Q. 6, 9 (CCPA 1977). In *Antonie*, the invention related to waste water treatment, and the inventor had discovered that a ratio of tank volume to contactor disc area of 0.12 gallons per square foot maximized the treatment capacity of the equipment. *Id.* at 7. The cited prior art taught the basic structure of a waste water treatment apparatus, but it was silent regarding quantitative design parameters except for the details of a single example. *Id.* The court held that the invention was nonobvious, focusing on the prior art's failure to recognize that the claimed ratio of tank volume to contactor disc area was an effective parameter for maximizing treatment capacity. *Id.* at 9. The court also noted that the reference was not trying to optimize treatment capacity.

Applicants believe there is a strong analogy between *Antonie* and the present case, in that the prior art cited in the present case did not recognize the effect of initiator to inhibitor ratio on the balance of spiral flow and cure time. None of the references cited concern themselves with spiral flow, which is an objective measure of the ability of a curable composition to flow within a molding tool prior to curing. Spiral flow is thus a good predictor of the ability of a composition to completely fill a hot mold. The present inventors were designing compositions for use in product applications that required high spiral flow values. They observed that the addition of functionalized poly(arylene

ether) to their compositions improved the final properties of the cured compositions, but also reduced spiral flow. Spiral flow could be improved by reducing the cure rate (e.g., by reducing the amount of curing initiator), but the curing times thus obtained were too long for the target molding cycles. It was only through grappling with these trade-offs and trying to work around them that the present inventors discovered that using curing initiators and inhibitors in the claim 1 amounts and ratio fundamentally changed the shape of the viscosity versus time curve and allowed a large increase in spiral flow with only a small and tolerable increase in curing time. The present inventors thus faced a problem not encountered in the cited prior art references, and they solved the problem using a result-effective variable – the initiator to inhibitor ratio – not recognized by the prior art as effective to improve composition properties.

Applicants therefore respectfully submit that claim 1 ratio of the curing initiator to the curing inhibitor is a result-effective variable that renders the claim patentable over Yeager or Zarnoch in view of Harada and Kagaya.

4. Summary

For all of the above, reasons, Applicants respectfully submit that their claim 1 composition is patentable over Yeager or Zarnoch in view of Harada and Kagaya. Given that claims 2-13, 18-25, 27-40 each include or further limit the limitations of claim 1, they too are patentable over the cited references. Given that claim 8 has been canceled, Applicants respectfully request the reconsideration and withdrawal of the rejection of claims 1-7, 9-13, 18-25, 27-40 under 35 U.S.C. § 103(a) over Yeager or Zarnoch in view of Harada and Kagaya.

Provisional Obviousness-Type Double Patenting Over 10/678243

Claims 1-13, 18-25, 27-40 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-51 of copending application No. 10/678243. The Office Action stated that the conflicting claims are not identical, but are not patentably distinct from each other because the copending application also claims methacrylate capped PPE (claim 42), unsaturated monomer and inhibitor (claim 39).

Applicants thank the Examiner for pointing out the potential obviousness-type double patenting issue between the claims of the present application and those of co-pending application No. 10/920744. In view of the possibility that claims in the cited application or the present application will be further amended before allowance, Applicants will defer responding to this provisional rejection until claims in the reference application are allowed, claims in the present application are otherwise allowable, and it is determined whether this provisional rejection becomes an actual rejection.

Provisional Obviousness-Type Double Patenting Over 10/678243

Claims 1-13, 18-25, 27-40 were also provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-51 of co-pending application No. 10/920744. The Office Action stated that the conflicting claims are not identical, but are not patentably distinct from each other because the copending application also claims methacrylate capped PPE (claim 5), unsaturated monomer and inhibitor (claim 26).

Applicants thank the Examiner for pointing out the potential obviousness-type double patenting issue between the claims of the present application and those of co-pending application No. 10/920744. In view of the possibility that claims in the cited application or the present application will be amended before allowance, Applicants will defer responding to this provisional rejection until claims in the reference application are allowed, claims in the present application are otherwise allowable, and it is determined whether this provisional rejection becomes an actual rejection.


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It is believed that the foregoing remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance is requested.

If there are any additional charges with respect to this Response or otherwise, please charge them to Deposit Account No. 06-1130 maintained by Applicants' attorneys.

Respectfully submitted,

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